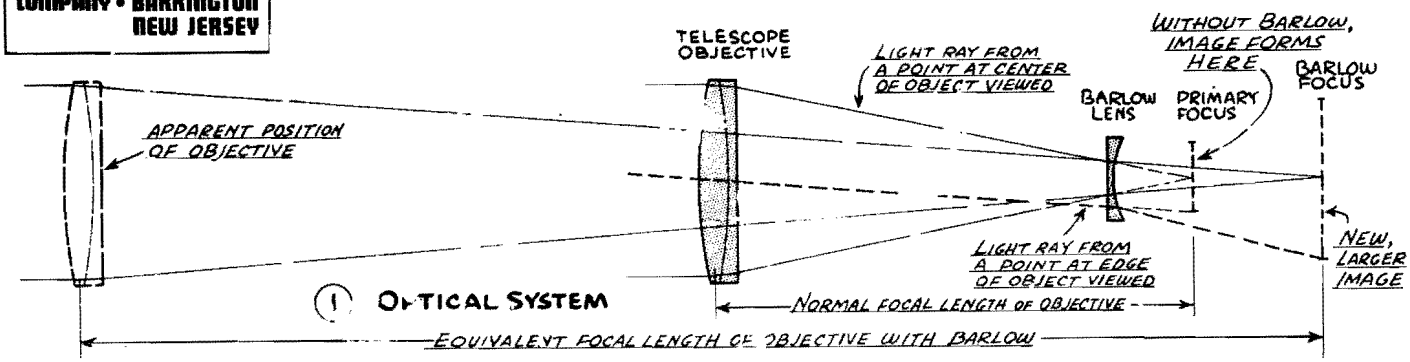
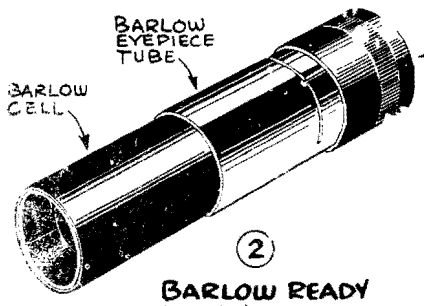
NO. 30-200
MOUNTED
BARLOW LENS

EDMUND SCIENTIFIC COMPANY • BARRINGTON NEW JERSEY

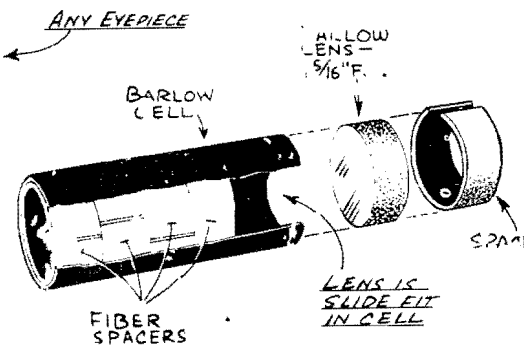
How to use a BARLOW

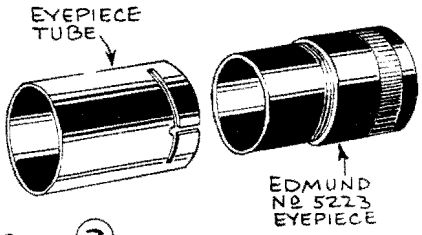


① OPTICAL SYSTEM



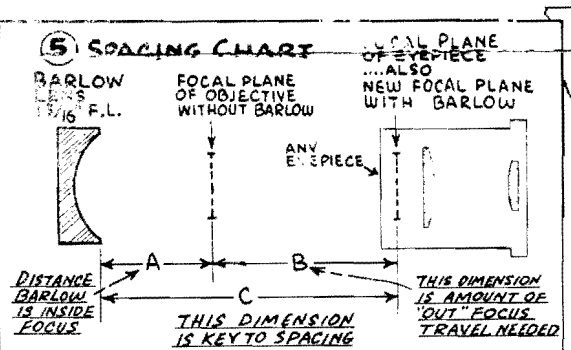
② BARLOW READY TO USE





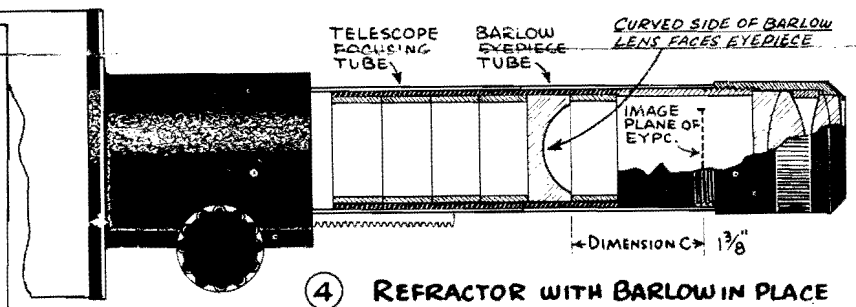
③ ASSEMBLY WITH ONE SPACER (2¼× WITH Nº 5223 EYEPIECE)

⑤ SPACING CHART



MAG.	C	B	A
1¼×	1/16"	1/16"	0"
1½×	3/8	3/16	3/16
1¾×	3/4	7/16	5/16
2×	1 1/16	11/16	3/8
2¼×	1 3/8	15/16	7/16
2½×	1 3/4	1 1/4	1/2
3×	2 3/8	1 3/4	5/8
3½×	3	2 5/16	11/16
*4×	3 3/4	3	3/4
5×	5	4 3/16	13/16
6×	6 1/4	5 3/8	7/8
10×	11 1/2	10 9/16	15/16
100×	129	127 15/16	1 1/16

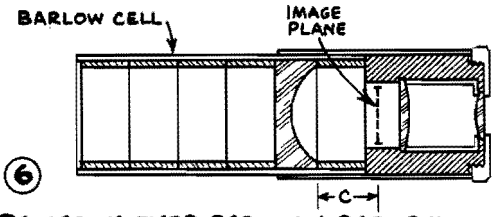
*PRACTICAL LIMIT



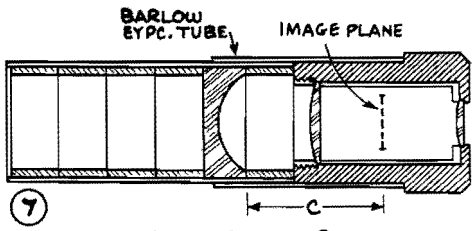
④ REFRACTOR WITH BARLOW IN PLACE

ABOUT 1810, Peter Barlow, English physicist and mathematician, discovered that a negative lens used a little inside the focus of a telescope could double and triple the magnification. Just how Barlow's idea works is shown in Figure 1. Note that the objective alone would focus light rays to a point, but the addition of a negative lens extends the distance the rays travel before coming to a focus. And--the important feature--if the extended light rays are projected forward, they locate the apparent position of the objective lens or mirror some distance ahead of the system, as shown by the dotted outline. This greater distance is the actual working focal length of the objective with Barlow. The Barlow lens is used in the same manner in either REFRACTING OR REFLECTING TELESCOPES.

The Edmund Barlow is a special crown of 1-5/16" f. l., made up in a metal cell with fiber spacing rings, as can be seen in Figures 2 and 3. The only know-how you need to use the lens is the spacing chart, Figure 5, and the only dimension



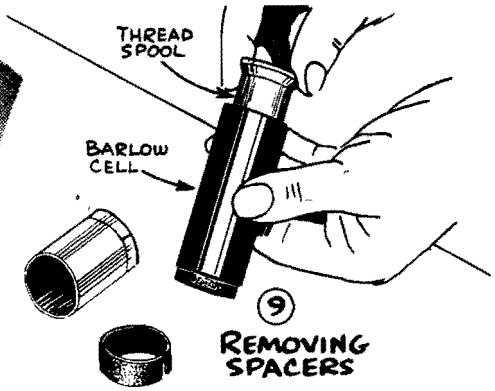
⑥ RAMSDEN EYEPIECE WITH BARLOW



⑦ HUYGENS EYEPIECE WITH BARLOW



⑧ FINDING IMAGE PLANE



⑨ REMOVING SPACERS

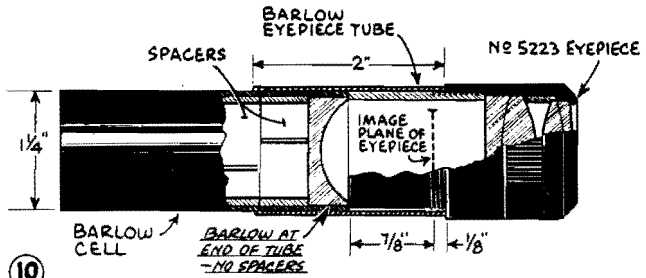
in the chart you actually need is the total distance from Barlow to image plane of eyepiece, Dimension C.

The image plane of any positive eyepiece will be a little ahead of the field lens, Figure 6. In the negative Huygens eyepiece, the image plane is about half-way between the two lenses, Figure 7. You can find the image plane of any positive eyepiece by experimenting with a strip of paper as a target, Figure 8. Once you know the image pl

is simply a matter of measuring. Spacing distances for the popular No. 5223 (1-1/8" f. l.) Edmund eyepiece are given in Figure 11.

When the Barlow is assembled with eyepiece, it is just like a long eyepiece and is used in exactly the same way you would use any other eyepiece. Many telescope observers like the Barlow so well they make up permanent Barlow eyepieces. However, most users adjust the Barlow for various powers and use it with different eyepieces. A thread spool is handy for pushing the spacer rings through the tube, Figure 9. The best use of the Barlow is in a power range from 1-3/4X to 3-1/2X, and within this range the combination gives excellent definition when used with a good eyepiece.

An extra feature is increased eye relief, which most users find welcome.



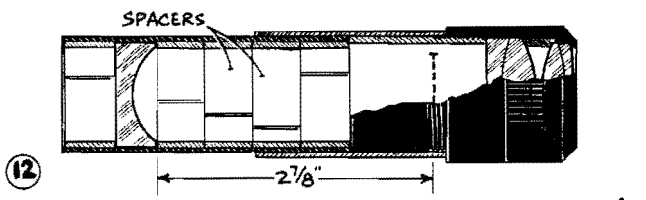
⑩ No. 5223 EYEPIECE AT MINIMUM BARLOW MAGNIFICATION

Power about 1¾x. Assembly fits into telescope focusing tube—just like a long eyepiece

⑪ BARLOW SPACING WITH № 5223 EYEPIECE

SPACERS BETWEEN BARLOW and EYEPIECE	ACTUAL SPACING (INCHES)	APPROX. BARLOW POWER	FOCUSING From NORMAL POSITION		APPROX. MAG. with VARIOUS OBJECTIVES		
			IN*	OUT	45"	50"	60"
NONE (SEE FIG.10	7/8"	1¾x	1½"	—	74x	81x	97x
ONE (SEE FIG.4	1 3/8"	2¼x	1 1/16"	—	92x	101x	121x
TWO	1 7/8"	2½x	¾"	—	102x	112x	135x
THREE	2 3/8"	3x	¼"	—	123x	135x	162x
FOUR (SEE FIG.12	2 7/8"	3½x	—	5/16"	143x	157x	191x

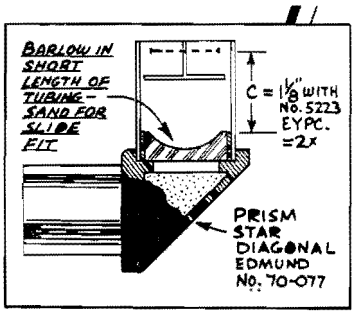
*Most setups require "IN" focus. From normal because the Barlow eyepiece tube (2" long) more than covers the "out" movement normally required

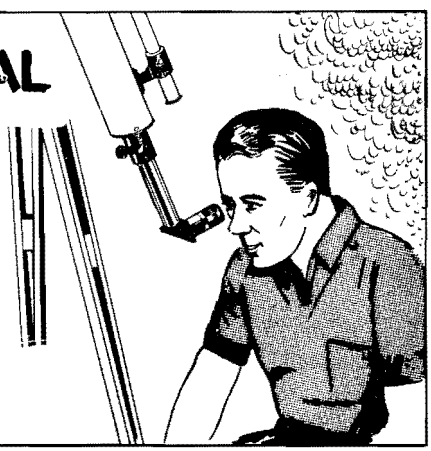


⑫ No. 5223 EYEPIECE AT MAXIMUM BARLOW M. ABOUT 3½x

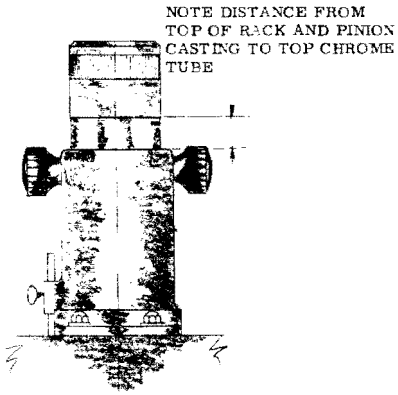
Using a BARLOW with STAR DIAGONAL

To use the Barlow lens with a star diagonal, make up the lens only in a short length of 1-1/4" outside diameter tubing. You will have to sand the outside of tube for a slide fit in diagonal eyepiece tube because the only means of removal is to let it slide out. If you make much use of this setup, it is best to mount the Barlow lens permanently in its short metal cell.

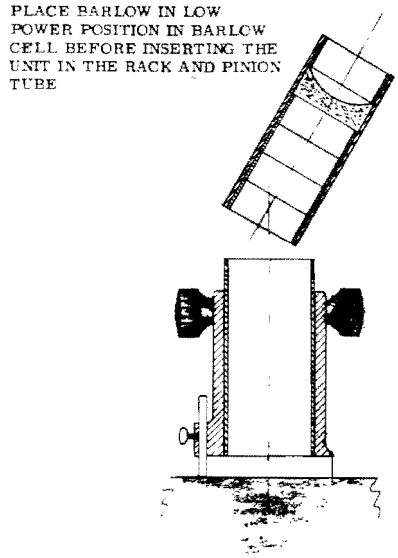




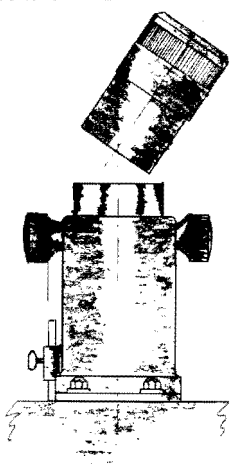
HOW TO USE A BARLOW



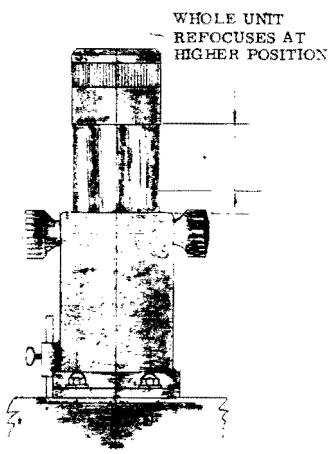
STEP 1: Focus in regular manner using only eyepiece, no Barlow. Measure or mark position on rack and pinion tube where eyepiece comes to focus.



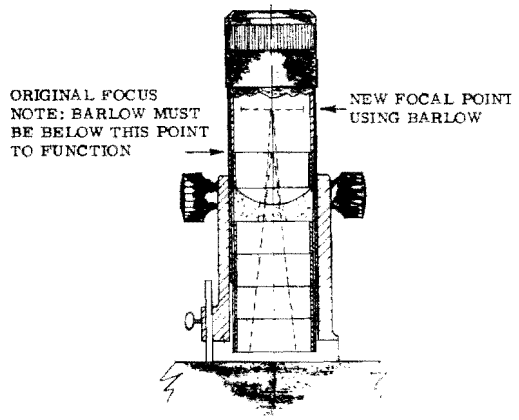
STEP 2: Remove eyepiece. Position Barlow lens in Barlow cell in the low power position. Insert Barlow cell into rack and pinion tube and it should slide all the way in.



STEP 3: After the Barlow cell has been inserted into the rack and pinion tube follow it up with the eyepiece. This will push the Barlow cell further.



STEP 4: Refocusing entire unit in normal manner. It will focus at a higher position. Approximate increase in height given in table and varies with eyepiece used and Barlow lens setting. Focus slowly.

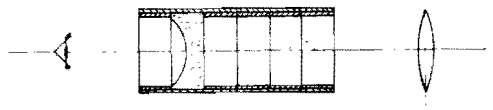


Cross section shows position of eyepiece Barlow tube with lens, and rack and pinion tube. Notice the original focal point and the new focal point extended by the Barlow lens. To function the Barlow must be located below the original focal point - never above.

Chart gives approximate increase in adjustment height needed to focus unit when using Barlow. Height measured from normal focus point.

Height at various Barlow positions

	#1	#2	#3	#4
28mm F. L. Kellner Eyep. S. N. 5223	1"	1-3/8"	1-13/16"	2-9/16"
1/2" Ramsden Eyepiece S. N. 30,203	3/4"	1"	1-1/2"	2"
1/4" Ramsden Eyepiece S. N. 30,204	1-1/16"	1-3/8"	1-13/16"	2-7/16"



Cross section showing possible Barlow positions. Steep curved toward eyepiece.

ADDITIONAL HINTS ON BARLOW OPERATION

The Barlow lens can be used with all focal length standard 1-1/4" diameter eyepieces to increase the power of a telescope. However, power should not be increased beyond the capabilities of the telescope (usually figured as 50X per inch of aperture). At extremely high power loss of light and a poor image will result, also vibration of the telescope will be amplified.

The eye relief is increased by the use of a Barlow. You will notice this in centering of your eye on certain eyepieces.

Initial experimenting with the Barlow should be done during daylight when well lighted and easily visible objects can be used for testing. With an idea of the settings and general procedure, night operation will be much easier. Low power Barlow settings in the #1 and #2 position combined with about 1" focal length eyepiece are recommended first. High power settings require critical focusing and should be accomplished after knowledge and experience has been gained with low power. Shifting of the fibre spacers provides a gradual increase in the magnification and increases the distance between the eyepiece and Barlow lens by steps.

The Barlow assembly consists of the Barlow lens, the Barlow cell, fibre spacers and 2 removable chrome eyepiece tubes, 1" and 2" respectively. When using the Barlow with a reflecting telescope the chrome tubes are generally not used since the Barlow cell is inserted down into the rack and pinion. However, at higher magnifications where extended focusing is required they can be used. In refractors these chrome tubes come in very handy in holding eyepieces.

In setting up the Barlow combination be sure the Barlow lens is located inside the focus of the objective or mirror so it intercepts the rays, otherwise it will not function. The whole combination Barlow and eyepiece focuses as a unit.

The fit of the Barlow cell into the rack and pinion focusing tube is important for easy operation. It should slide inside with only slight pressure and should remain in position and not fall on through. To prevent "Fall Through", just squeeze the Barlow cell til it becomes slightly egg shaped or a small burr or dimple can be raised with a center punch or screw driver from inside the tube. Sometimes the Barlow cell will not fit in the rack and pinion focusing tube because it has been dropped and dented or burred. Burrs can easily be removed by sanding or filing.

A Barlow lens if understood by the user can give excellent results and greatly increase the versatility of any telescope and available eyepiece.

DIRECTIONS FOR USING RETICLE LIGHT

NO. 50,219

This is a well made govt. surplus instrument light and can be easily adapted to light your reticle, plus a nice little light for looking at star charts, eye-pieces, setting circles etc. To light your reticle: Unscrew the light housing from the small black box, a pair of pliers may be necessary to do this. The black box is made of brass and is easily cut with a hack saw, cut according to Figure 1.

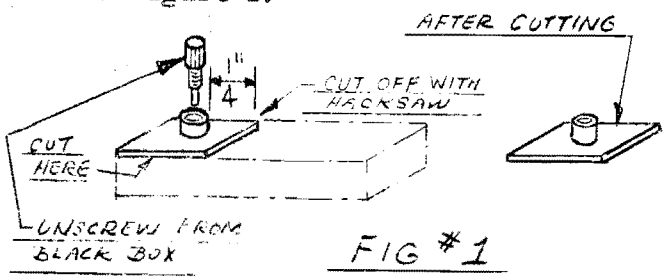
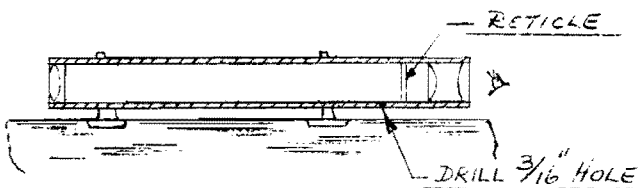
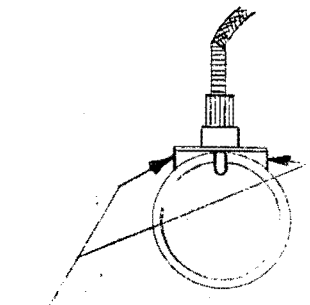


FIG #1

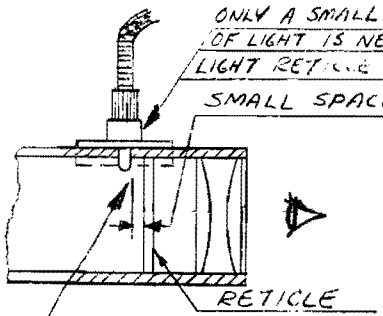


IN TUBE NEAR RETICLE FOR RETICLE LIGHT BULB EITHER TOP OR BOTTOM. BOTTOM WOULD BE PREFERRED BY MOST PEOPLE.



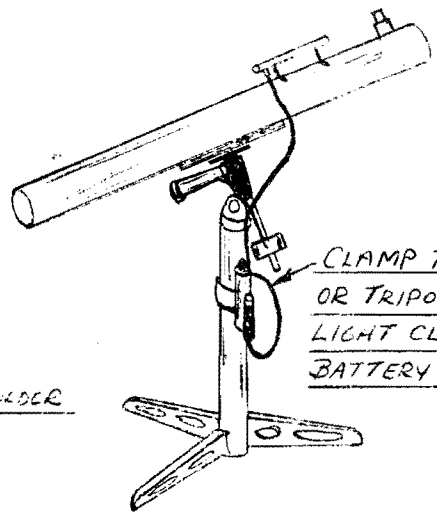
FRONT VIEW

ALUMINUM CEMENT OR WOOD WEDGES CEMENTED TO TUBE & LIGHT HOLDER WITH EPOXY OR FASTEN WITH SMALL SHEET METAL SCREW.

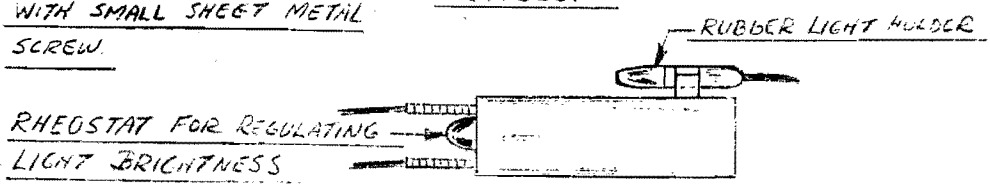


SIDE VIEW

CAUTION: MAKE SURE DRILL CLEARS GLASS OR RETICLE.



CLAMP TO PEDESTAL OR TRIPOD LEG. SMALL LIGHT CLIPS ONTO BATTERY CASE.



BATTERY HOLDER AND RHEOSTAT

This takes a 1-1/2V "D" flashlight battery which will light both lights. NOTE: Due to the many designs of telescope mounts it is difficult to recommend one for mounting the battery holder on your equatorial or altazimuth mount but a little study will enable you to mount it without difficulty. You can mount this on a 1" O. D. casting without any change. Battery holder can mount on tripod leg, pedestal, equatorial polar axis or declinaton axis or on telescope tube, hinge and clamp can also be sawed off battery case and hose clamps or straps can be used to hold battery case to tube, mounting, etc.